Zagazig J. Agric. Res., Vol. 44 No. (5) 2017 1819-1826

Agricultural Biochemistry and its Application

http:/www.journals.zu.edu.eg/journalDisplay.aspx?Journalld=1&queryType=Master

EVALUATION OF PHYSICO-CHEMICAL PROPERTIES OF CORN, OLIVE, GARDEN CRESS, CUMIN OILS AND THEIR BLENDED MIXTURES

Ahmed S.M. Abd El-Salam*, M.A. Doheim, M.Z. Sitohy and S.E.M Labib

Biochem., Dept., Fac. Agric., Zagazig Univ., Egypt

Received: 24/07/2017; Accepted: 15/08/2017

ABSTRACT: This study was carried out, mainly to evaluate physico-chemical properties of corn, olive, garden cress, cumin oils and blended mixtures of corn oil with olive, garden cress or cumin oils by 10 or 20 percentages. Results showed that predominant saturated fatty acid in that oils was palmitic acid (10.49, 16.06, 8.98 and 8.84%, respectively) while predominant mono unsaturated fatty acid was oleic acid (22.76, 65.72, 36.75 and 43.34%, respectively) and poly unsaturated fatty acid was linoleic acid (57.81, 12.41, 41.99 and 40.44%, respectively). Omega-3 content was higher in garden cress oil (3.63) than those of corn, olive, and cumin oils (0.65, 0.80 and 0.32%, respectively) Superior phenolic compound of individual oil was oleuropin (400.0, 625.0, 49272.0 and 128387 µg/100g, respectively) as well as, their mixtures. Blending process increased phenolic compound contents in oil mixtures than corn oil. Mixtures have higher value of each of acidity, peroxide value, P-anisidine value, and DPPH capacities than corn oil (21%, 23.1%, 23.8%, 24.5%, 22.8%, 27.8% and 17.9%, respectively). k270 and k232 values of mixtures were higher than corn oil.

Key words: Corn oil, olive oil, garden cress oil, cumin oil, blending oil.

INTRODUCTION

Moulodi *et al*. (2015) revealed that oils and fats play an important role in human health, commerce and economy. Oil quality was determined based on quality attributes as hour of use, smoke evolution, foam height and changing of the original color or by measuring quality variables as percentage of free fatty acids ,peroxide value, p-anisidine levels, total polar compounds, fatty acids composition and temperature, fatty acids, both free and as part of complex. Lipids are important in metabolism, since they considered major metabolic fuel (storage and transport of energy), essential component of all membrane, genetic regulators, thermal and electrical insulation agents, mechanical protection factors, (Rustan and Drevon, 2005). Simopoulos (2002) studded ratio of omega -6 to omega-3, essential fatty acids and their effect on human beings diseases, and reported that a lower ratio of omega-6/omega-3 fatty acids is more desirable in reducing the risk of many of the chronic diseases.

Luzia and Jorge (2011) revealed that most important natural antioxidants are the pheonlic compounds (flavonoids, phenolic acids and tannins), nitrogrnous copounds (alkaloids, amino acids. peptides, amines and chlorophyll products) carotenoids, tocopherols and ascorbic acid. Fares *et al.* (2016) determined physical and chemical properties of olive oil products from different varieties of olive fruits in Tunisia and revealed that oxidative stability parameters were, fatty acids which were between 0.32 ± 0.04 and 0.34 ± 0.06, pv $(meqO_2kg)^{-1}$ were between 9.96 ± 0.78 and 10.66 ± 0.96, k_{232} were between 2.07 ± 0.09 and 2.13 ± 0.11, k_{270} were between 0.128 ± 0.01 and 0.146 ± 0.04, as well as fatty acid compositions were, C16 between 14.51 ± 0.068 an 16.43 ± 0.64, C16:1 between 1.54 ± 0.38 and 2.22 ± 0.01, C17 between 0.03 ± 0.01 and 0.041 ± 0.02 , C17: 1 between 0.07 ± 0.02 and 0.10 ± 0.10, C18 between 2.03 ±

* **Corresponding author: Tel. :** +201223859331
E-mail address: sami.olive@yahoo.com

0.26 and 2.13 ± 0.15 C18:1 between 62.11± 1.55 and 65.64 ± 1.88, C18:2 between 14.81 ± 0.83 and 15.67 ± 1.21, C18:3 between 0.65 ± 0.08 and 0.66 ± 0.06, C20 between 0.38 ± 0.06 and 0.42 ± 0.03 and C20: 1between 0.26 ± 0.05 and0.28 ± 0.06, also they determined plant pigments (mg/kg) and found that chlorophylls were between 2.29 and 2.53, while carotenoids were between 1.63 and 1.74 as well as, they determined phenolic concentration and revealed that phenolic compounds content which ranged from 100 to 350 mg/kg.

Scrob *et al*. (2013) stated that corn oil is an excellent source of polyunsaturated fatty acids, PUFA especially linoleic acid, an essential fatty acid and corn oil is considered mostly stable to oxidation, due to minor level of linolenic acid. Also they revealed that dominant saturated fatty acids were palmatic acid (15.83-21.81%) and stearic acid (3.2- 3.7%), while the most present fatty acid was linoleic acid (PUSFA), with amounts 45.06% - 62.34% and followed by oleic acid (mono unsaturated fatty acid) with amount of 15.03% - 23.59%. Linolenic acid (18:3), palmitoleic acid (16:1), arachidic acid (20:0), behenic acid (22:0), erucic acid (22:1) and ligoceric acid (24:0) were found as very small amount.

Zia-UI-Haq *et al.* (2012) reported that garden cress oil contains palmitic acid (10.3 ± 0.12) g/100g, palmitoleic acid (0.70 ± 0.30 g/100 g), α-linoleic acid (32.18%) and oleic acid (30.5%). These results indicated to the importance of garden cress oil as a source of omega -3 fatty acids. Diwaker *et al*. (2010) reported that peroxide value of garden cress oil ranged from 0.70 ± 0.13 to 4.09 ± 0.16, palmetic acid (9.6 ± 0.32 to 10.0± 0.00), oleic acid, ω -9 (22.1 ± 0.06 to 22.9 ± 0.08), linoleic acid, n ω -6 (11.1 ± 0.23 to 11.9 ± 0.02) and linolenic acid, ω -3 (33.6 ± 0.56 to 35.7 ± 0.86), according to the method of extractions.

Jirovetz *et al.* (2005) reported that cumin aldehydes (36%) β- Pignene (19.3%) p-cymene (18.4) and 8-terpinene were the major compounds found in cumin oil and have antimicrobial effect. Topal *et al.* (2008) and Wanner *et al.* (2010) revealed that cuminal (6.39%), edulan-1 (3.72%) lenoleic acid (9.11%) palmitic acid (14.69%) and oleic acid (42.94%) as well as cuminic aldehyde were principle biochemical compounds found in cumin oil. Nadeem and Riaz (2012) found that phenolic compounds content varied from 4.1 to 53.6 mg /g D.W, dependent on the method of extraction and varieties. Also, Rebey *et al.* (2013) from their study on cumin seeds maturation, reported that mature seeds contain mainly petroselinic fatty acid (55.4%) followed by palmitic acid (23.82%) linoleic acid (12.4%) and palmitoleic acid (2.12%) .

Umesha and Naidu (2012 and 2015) and Shail *et al* (2016) revealed that blending process of vegetable oils improved physico-chemical properties of mixtures, positive physiological, antimicrobial antioxidants effect.

This study was carried out to evaluate fatty acid composition, phenolic compound fraction contents, physical properties and antioxidant capacities of corn oil, olive oil, garden cress oil, cumin oil and blends of corn oil with olive, garden cress, or cumin oil.

MATERIALS AND METHODS

This study was conducted to evaluate and compare physico-chemical properties of four manufactured oils, corn oil, olive oil, garden cress oil and cumin oil, as well as their blending affect on the physico-chemical properties of mixtures.

Samples

1- Corn oil (*Zea mays*) sample (Crestal) was purchased from local market manufactured by Arma Company, Egypt.

2- Olive oil (*Olea europaea*) kindly was obtained from El-Salhiya Olive Oil Mill. Sharkia, Egypt.

3- Garden cress (*Lepidium sativum* L.) (captin oil) oil from local market

4- Cumin (*Cuminum cyminum* L.) (captin oil) oil from local market

Blending process

1. Mixture of corn (*Zea mays*) oil and olive (*Olea europaea*) oil (90% and 10%, respectively).

2. Mixture of corn (*Zea mays*) oil and olive (*Olea europaea*) oil (80% and 20%, respectively).
3. Mixture of corn (*Zea mays*) oil and garden cress (*Lepidium sativum* L.) oil (90% and 10%, respectively).
4. Mixture of corn (*Zea mays*) oil and garden cress (*Lepidium sativum* L.) oil (80% and 20%, respectively).
5. Mixture of corn (*Zea mays*) oil and cumin (*Cuminum cyminum* L.) oil (90% and 10%, respectively).
6. Mixture of corn (*Zea mays*) oil and cumin (*Cuminum cyminum* L.) (80% and 20%, respectively).

Physico Chemical Analysis

1. Acid values of individual oil and mixtures were determined according to AOAC (1990).
2. Peroxide values of individual oil and mixtures were determined according to AOAC (1990)
3. P-anisidine values were determined according to AOCS Recommended Practice Ti la-64 (1998).
4. K 232 and K 270 values of individual oil and mixtures were determined according the method recommended by IUPAC (1979).
5. Radical scavening activity of individual oil and mixtures were evaluated as recommended by Ramadan *et al.* (2010).
6. Fatty acid identification and quantification of individual oil and mixtures were determined using GC technique as recommended in AOAC (2012).
7. Phenolic compounds were identified and quantified in individual oil and mixtures using HPLC technique as recommended by Goupy *et al.* (1999).

RESULTS AND DISCUSSION

Fatty Acids Profile

Fatty acids composition is one of the principle chemical parameters of vegetative oils, so Table 1 contains data of fatty acid profile of four oils namely, corn oil, olive oil, garden cress oil, cumin oil and 6 mixtures resulted from blending corn oil by olive oil, garden cress oil or cumin oil with 10% or 20%, respectively. it can be noticed that the main fatty acid found in corn oil is linoleic acid (57.81%), followed with oleic acid (27.78%) and palmitic acid (10.49%). In olive oil, oleic acid amounted (65.72%) followed with palmitic acid (16.06%) and linoleic acid (12.41%). In garden cress oil, linoleic acid was (41.99%), followed with oleic acid (36.75%) and palmitic acid (8.98%) and in cumin oil, oleic acid amounted (43.34%) followed with linoleic acid (40.49%) and palmitic acid (8.84%). These results are in agreement with those obtained by Haddada *et al.* (2008) Al-Jasass and Al-Jasser (2012), Sudar *et al.* (2012), Rebey *et al.* (2013), Ali (2013) and Scrob *et al*. (2013). Blending process of corn oil with olive oil, garden cress oil and cumin oil improved mixtures content of stearic acid from 2.09 to 2.13, 2.16, 2.39, 2.7, 2.44 and 2.79, respectively, as well as oleic acid contents from 2.78 to 13.75, 35.37, 28.68, 29.57, 29.34, 30.89, respectively, but blending process minimized linoleic acid contents of mixtures from 57.81 (corn oil) to 53.27, 48.73, 56.23, 54.08, 56.08 and 54.35, respectively. Worthily, pointed to increase of omega- 3 contents when corn oil was blended with garden cress oil, while amount of omega -3% increased from 0.65 (corn oil) to 0.95and 1.25 at 10% and 20%of garden cress oil, respectively, so mixture must be physiologically more benefit as reported by Simopoulos (1999), Connor (2000), Diwakara *et al.* (2008), Gogus and Smith (2010), Naji (2013) and Umesha and Naidu (2015).

Phenolic Compound Status

Phenolic compounds are giving vegetable oils their importance as sources of antimicrobial and antioxidants agents Owen *et al.* (2000), Haddada *et al.* (2008), Topal *et al.* (2008), Wanner *et al.* (2010), Zia-Ul-Haq *et al.* (2012) and Doke and Guha (2014). Results in Table 2 contains phenolic compound contents of corn oil, olive oil, garden cress oil and cumin oil as well as, their blended mixtures with 10% or 20%, respectively of olive oil, garden cress oil or cumin oil which were added to corn oil. The principle phenolic compounds found in corn oil were mainly oleuropin (4000.0 µg/100g) followed by salycilic acid (86.0 µg/100g),

Table 1. Fatty acid composition of studied four oils and their mixtures

Test item	Corn oil	Olive oil	Garden cress oil	Cumin oil	Corn oil 90%+ olive oil 10%	Corn oil 80 % +olive oil 20%	Corn oil 90% +garden cress oil 10%	Corn oil 80 % + garden cress oil 20%	Corn oil 90%+ cumin oil 10%	Corn oil 80 % +cumin oil 20%
C 16 :0	10.49	16.06	8.98	8.84	11.05	11.60	10.4	10.19	10.33	10.16
C 16 : 1	0.12	1.64	0.13	0.14	0.27	0.42	0.12	0.134	0.12	0.14
C 17 : 0	0.06	0.07	0.06	0.07	0.06	0.06	0.06	0.06	0.61	0.62
C 17 : 1	0.03	0.11	0.03	0.03	0.04	0.05	0.03	0.03	0.03	0.03
C 18 : 0	2.09	2.44	5.12	5.59	2.13	2.16	2.39	2.7	2.44	2.79
C 18 : 1	27.78	65.72	36.75	43.34	31.57	35.37	28.68	29.57	29.34	30.89
C 18 : 2	57.81	12.41	41.99	40.49	53.27	48.73	56.23	54.08	56.08	54.35
C 18 : 3 n6	0.09	-	-	0.02	0.08	0.07	0.08	0.07	0.08	0.08
C 18 : 3 n3	0.65	0.80	3.63	0.32	0.67	0.68	0.95	1.25	0.62	0.58
C 20 : 0	0.35	0.40	0.83	0.53	0.36	0.36	0.40	0.45	0.37	0.39
C 20: 1	0.27	0.26	1.47	0.18	0.27	0.27	0.39	0.51	0.26	0.25
C 22 : 0	0.24	0.08	0.24	0.10	0.22	0.21	0.24	0.24	0.23	0.21
C 22 : 1	-	-	0.74	-	-	-	0.74	0.74	-	-

Table 2. Phenolic compound profile of four studied oils and their mixtures

Test item	Corn oil	Olive oil	Garden cress oil	Cumin oil	Corn oil 90%+ olive oil 10%	Corn oil 80 % + olive oil 20%	Corn oil 90% + garden cress oil 10%	Corn oil 80 % + garden cress oil 20%	Corn oil 90% + cumin oil 10%	Corn oil 80 % + cumin oil 20%
Pyrogallol	43.54	159.20	1477	1251.95	55	66.20	186.40	330	164.2	285.22
Gallic	1.71	5.34	88.88	44.15	2	2.44	10.43	19.14	5.95	10.20
4- amino- benzoic	1.09	4.89	14.52	12.31	1.47	1.85	2.43	3.78	2.21	3.33
Protocatchuie	6.16	39.78	45.57	43.13	9.52	12.88	10.10	14.04	9.85	13.55
Catechin	5.59	116.10	102.4	97.73	16.6	27.69	15.2	24.95	14.8	24.02
Catechol	4.78	21.86	42.73	29.28	6.4	8.19	8.50	12.37	7.23	9.68
Chlorogenic	14.84	283.5	55.02	125.13	41.7	68.57	18.8	22.8	25.86	36.89
Caffeine	14.38	54.75	150.8	99.32	18.42	22.45	28.02	41.66	22.8	31.37
Caffeic	4.98	15.98	34.23	29.80	6.08	7.18	7.91	10.83	7.46	9.94
Vanillic	8.42	20.94	90.65	122.4	9.67	10.97	16.64	24.91	19.82	31.26
p-coumarine	4.90	8.99	58.49	16.92	5.31	5.72	10.26	15.62	6.10	7.30
Ferulic	17.3	95.94	89.03	65.16	25.16	33.02	24.47	31.65	22.08	26.87
Oleuropin	400	625	49272	128387	422.5	445	5287.2	10174.4	13198.7	25997.4
Reversterol	-	-	-	-	-	-	-	--	-	-
Ellagic	33	384	496	647	68.10	103	79.30	125	94.4	155.8
Benzoic	66	319	1854	1858	91.30	116.60	244	423	245	424
Coumarin	3.94	216	124	254	25.15	46.35	15.95	27.95	28.95	53.95
Salycilic	86	290	747	1404	106	126	152	218	217	349
Cinnamic	0.70	18.27	13.88	53.42	2.46	4.21	2.02	3.34	5.97	11.24

benzoic acid (66.0 µg/100g), pyrogallol (43.54 µg/100g), ellagic (33.0 µg/100g), ferulic acid (17.3 µg/100g), chlorogenic (14.44 µg/100g), caffeine (14.38 µg/100g) vanillic (8.342 µg/ 100g), protocathuic (6.16 µg/100g), catechin (5.59 µg/100g) caffeic (4.98 µg/100g) p-coumarine (4.90 µg/100g catechol (4.78) and traces of other phenolic compounds. Olive oil contains mainly oleuropin (625.0 µg/100g), ellagic (384.0 µg/100g) benzoic (319.0 µg/100g), salycilic (290.0 µg/100g), chlorogenic (283.5 µg/100g), coumarin (216.0 µg/100g), pyrogallol (159.20 µg/100g) catechin (116.10 µg/100g), freulic (95.94 µg/100g), caffeine (54.75 µg/ 100g), protocatchuie (39.78 µg/100g), followed by catechol (21.86 µg/100g), vanillic (20.94 µg/100g), cinnamic (18.27 µg/100g), caffic (15.98 µg/100g), p-coumarine (8.99 µg/ 100g) and gallic (5.34 µg/100g). Garden cress oil contains principle oleuropin (49272.0 µg/ 100 g) benzoic (1854.0 µg/100g), pyrogallol (1477.0 µg/ 100g), salycilic (747.0 µg/100g), ellagic (446.0 µg/100g), caffeine (150.8 µg/ 100g), coumarin (124.0 µg/100g), catechin (102.4 µg/ 100g) vanillic (90.65 µg/100g) freulic (89.03 µg/100g), gallic (88.88 µg/100g), p-coumarine (58.49 µg/100g), chlorogenic (55.02 µg/100g), proticatchuie (45.57 µg/100g), catechol (42.73 µg/100g), followed by caffeic (34.23 µg/100g), 4-aminobenzoic (14.52 µg/ 100g) and cinnamic (13.88 µg/100g). Also, data of phenolic compounds contents belonging to cumin oil were illustrated in Table 2. It can be revealed that predominant phenolic compounds at cumin oil were oleuropin (128387.0 µg/100g) benzoic (1858 µg/100g), salycillic (1404.0 µg/ 100g), pyrogallol (1251.95 µg/100g), ellagic (647.0 µg/ 100g), coumarin (254.0 µg/100g), chlorogenic (125.13 µg/100g), vanillic (122.4 µg/100g), caffeine (99.32 µg/100g), catechin (97.73 µg/ 100g) ferulic (65.16 µg/100g) cinnamic (53.42 µg/100g), gallic (44.15 µg/100g), protocatchuie (43.13 µg/100g) followed by cafeic (29.80 µg/100g), catecol (29.28 µg/100g), p-coumarine (16.92 µg/100g) and 4- amino benzoic (12.31 µg/100g). It can be noticed from phenolic compounds status shown in Table 2, that mostly, all mixtures have higher contents of phenolic compounds than those of corn oil as reported before by Giacometti *et al.* (2012), Umesha and Naidu (2012 and 2015). Worthily, it can be revealed that fatty acids composition, phenolic compounds contents, microbial and antioxidants activities dependent on source of oil, maturity, time of harvesting, storage condition, method of extractions and solvents as revealed before by Tuck and Hayball (2002). Behera *et al*. (2004), Jirovetz *et al*. (2005), Reblov (2012), Al-Jasess and Al-jasser (2012), Rebey *et al.* (2013), Roustakhiz and Raissi (2017), Yenge *et al.* (2017),

Physical Properties

Results of physical parameters of corn oil, olive oil, garden cress oil and cumin oil, as well as their blended mixtures were listed in Table 3. Results showed that garden cress oil was more acidic (3.11%) than corn oil (0.078%) , olive oil (0.42 %) and cumin oil (1.22%), which showed the higher PV value (17.5 meq$o_2$kg) than those of corn oil (2.5 meq$o_2$kg), olive oil (15.0 meq$o_2$kg) and cumin oil (5.6 meqO_2kg), higher p-anisidine value (12.5) than those of corn oil (3.0) and olive oil (11.8), but less than those of cumin oil (15.0), also it has k270 value (0.345) higher than those of corn oil (0.052), olive oil (0.120) and cumin oil (0.170) but k232 values, a first was cumin oil (2.082) followed by garden cress oil (2.055), corn oil (1.891) and olive oil (0.825), these values were in according with fatty acids compositions in Table 1. Of view of DPPH capacity, results in Table 3 show that garden cress was superior (74.9%) followed by cumin oil (67.8%), olive oil (43.9%) and corn oil (17.9%) as reported before by Ramadan *et al* (2010). Results in Table 3 showed also that ,acidity of all mixtures was higher than acidity of corn oil (0.079, 0.17, 0.19, 0.35, 0.61, 0.20 and 0.42, respectively. Peroxide values of mixtures were higher (3.9, 5.5, 7.5, 8.0, 2.8 and 3.0, respectively) than PV of corn oil (2.5) also, k270 and k232 values of all mixtures were higher than corn oil, as well as DPPH capacities of mixtures (21%, 23.1%, 23.8%, 29.5%, 22.8% and 27.8%, respectively) were more than corn oil (17.9%) It can noticed that DPPH capacity, either for individual oil or for blending mixtures is in agreement with phenolic compounds contents of individual oil and mixtures listed in Table 2. Since these results were in harmony with those before noticed by Diwakar *et al.* (2010), Youssef *et al.* (2014) and Fares *et al*. (2016).

Table 3. Acidity, peroxide value (pv) p- anisidine value (pav) k 270, k232 and DPPH activities of studied four oils and their mixtures

Sample	Acidity	Peroxide value (pv)	p-anisidine value (PAV)	K270	K232	DPPH
Corn oil	0.079	2.5	3.0	0.052	1.891	17.9%
Oive oil	0.42	15	11.8	0.120	0.825	43.9%
Gargen cress oil	3.11	17.5	12.5	0.345	2.055	74.9%
Cumin oil	1.22	5.6	15.0	0.170	2.082	67.8%
Corn oil 90% + Olive oil 10%	0.11	3.75	3.88	0.059	1.78	20.49%
Corn oil 80% + Olive oil 20%	0.15	5.0	4.76	0.034	1.69	23%
Corn oil 90% + Garden cress oil 10%	0.38	4.0	3.97	0.081	1.91	23.59%
Corn oil 80% + Garden cress oil 20%	0.69	5.5	4.9	0.079	1.92	29.28%
Corn oil 90% + Cumin oil 10%	0.19	2.8	4.2	٠,064	1.91	22.9%
Corn oil 80% +Cumi oil 20%	0.31	3.12	5.4	0.440	1.92	27.8%

Acknowledgments

The authors would like to express their thanks to Prof. Mohamed Fawzy Ramadan, who helped and supported this work.

REFERENCES

Al-Jasass, F.M. and M.S. Al-Jasser (2012). Chemical composition and fatty acid content of some spices and herbs under Saudi Arabia conditions. Sci. World J. V., 1-5.

Ali, R.F.M. (2013). Preparation and characterization of protein isolate and biodiesel from garden cress seed. Europ. J. Chem., 4 (2): 85-91.

AOAC (1990). Official Methods of Analysis of the Association of Official Analytical chemistry. 13th Ed. AOAC, Washington DC. USA.

AOAC (2012). Association Official Analytical Chemists 17th Ed. Washington Dc., USA.

AOCS (1998). p-Anisidine value method Cd 18-90 D Firestone(Ed.), Official Methods and Recommended Practices of the American Oil Chemists' Society, AOCS Press, Champaign III, USA.

Behera, N.S.S. and L.J.M. Rao (2004). Microwave heating and conventional roasting of cumin seeds (*Cuminum cyminum* L.) and effect on chemical composition of volatiles. Food Chem., 87 : 25–29.

Connor, W.E. (2000). Importance of n-3 fatty acids in health and disease. Ame. Soc. Clin. Nut., 71 :171S–5S.

Diwakar, B.T., P.K. Duttaa, B.R. Lokeshb and K.A. Naidu (2008). Bio-availability and metabolism of n-3 fatty acid rich garden cress (*Lepidium sativum*) seed oil in albino rats. Prostaglandins, Leukotrienes and Essential Fatty Acids, 78 : 123–130.

Diwakar, B.T., P.K. Dutta, B.R. Lokesh and K.A. Naidu (2010). Physicochemical properties of garden cress (*Lepidium sativum* L.) seed oil. J. Ame. Oil Chem. Soc., 87: 539–548.

Doke, S. and M. Guha (2014). Garden cress (*Lepidium sativum* L.) seed - an important medicinal source: A Rev. J. Nat. Prod. Plant Res., 4 (1):69-80.

Fares, N., I.K. Jabri, S. Sifi and M. Abderrabba (2016). Physical chemical and sensory characterization of olive oil of the region of

Kairouan. J. Mater. Environ. Sci., 7 (6): 2148-2154.

Giacometti, J., A.B. Tomljanovic, C. Milin, M. Cuk and B.R. Stasic (2012). Olive and corn oil enriched diets changed the Phospholipid fatty acid composition in mice liver after one-third hepatectomy. Food and Nut. Sci., 3: 240-248.

Gogus, U and C. Smith (2010). ω -3 Omega fatty acids: a review of current knowledge. Int. J. Food Sci. and Technol., 45:417–436.

Goupy, P., M. Hugues, P. Boivin and M.J. Amiot (1999). Antioxidant composition and activity of barley (*Hordeum vulgare*) and malt extracts and of isolated phenolic compounds. J. Sci. Food and Agric., 79: 1625-1634.

Haddada, F.M., D. Krichène, H. Manai, I. Oueslati, D. Daoud and M. Zarrouk. (2008). Analytical evaluation of six monovarietal virgin olive oils from Northern Tunisia. Eur. J. Lipid Sci. Technol., 110: 905–913.

IUPAC (1979). Standard Methods for the Analysis of Oils and Fats and Derivatives: Pergamon Press. Toronto, Canada.

Jirovetz, L., G. Buchbauer, A.S. Stoyanova, V.E. Georgiev and S.T. Damianov (2005). Composition, quality control and antimicrobial activity of the essential oil of cumin (*Cuminum cyminum* L.) seeds from Bulgaria that had been stored for up to 36 years. Int. J. Food Sci. and Technol., 40: 305–310 305.

Luzia, D.M.M. and N. Jorge (2011). Antioxidant activity, fatty acid profile and tocopherols of Tamarindus indica L. seeds Cienc. Tecnol. Aliment., Campinas, 31(2): 497-501.

Moulodi, P., P. Qajarbeigi, K. Rahmani, A.H.H. Babaei and A.M. poorasl (2015). Effect of fatty acid composition on thermal stability of extra virgin olive oil. J. Food Quality and Hazards Control, 2 :56-60.

Nadeem, M. and A. Riaz (2012). Cumin (*Cuminum cyminum*) as a potential source of antioxidants. Pak. J. Food Sci., 22 : 101-107.

Naji, N.S. (2013). The effect of corn oil in sperm parameters and levels of some hormone, elements and biochemical parameters in serum of white male rabbits. J. Nat. Sci. Res., 3 (12): 133-143.

Owen, R.W., A. Giacosa, W.E. Hull, R. Haubner, B. Spiegelhalder and H. Bartsch. (2000). The antioxidant/anticancer potential of phenolic compounds isolated from olive oil. Europ. J. Cancer, 36 :1235-1247.

Ramadan, M.F., S.G. Kinni and M. Seshagiri (2010). Fat-soluble bioactives, fatty acid profile and radical scavenging activity of *Ssemecarpus anacardium* seed oil. J. Ame. Oil Chem. Soc., 87: 885-94.

Rebey, I.B., S. Kefi, F. Limam and B. Marzouk (2013). Variations in fatty acid composition during maturation of cumin (*Cuminum cyminum* L.) seeds. Afr. J. Biotechnol., 12 (34): 5303-5307.

Reblov, Z. (2012). Effect of temperature on the antioxidant activity of phenolic acids. Czech J. Food Sci., 30 . 2: 171–177.

Roustakhiz, J. and A. Raissi (2017). Properties, cultivation method and requirements of cumin (*Cuminum cyminum* L.) - an overview. Int. J. Farming and Allied Sci., 6 (1): 24-29.

Rustan, A.C. and C.A. Drevon (2005). Fatty Acids: Structures and Properties. Encyclopedia of Life Sciences. John Wiley and Sons, Ltd. www.els.net: 1-5.

Scrob, S., S. Muste and M. Culea (2013). Gc/ms analysis of fatty acids in some corn inbred lines. Romanian J. Biophys, 23: 107–111.

Shail, D.M., K. Neeraj and L.N. Gupta (2016). Nutritional importance of *Lepidium sativum* L. (Garden cress/Chandrashoor). Int. J. Pharm. and Anal. Res., 5 (1) :152-160.

Simopoulos, P.A. (2002). The importance of the ratio of omega-6/omega-3 essential fatty acids. Biomed. Pharmacotherapy, 56 : 365–379.

Simopoulos, P.A. (1999). Essential fatty acids in health and chronic disease1,2. Ame. Soc. Clin. Nut., 70:560S–9S.

Sudar, R., I. Brkic, Z. Jurkovic, T. Ledencan, V. Jurkovic and D. Simic (2012). Fatty acids composition of oil from OS corn hybrids.

Plant Breeding and Seed Production. Section 3 . Genet., 335-339 .

Topal, U., M. Sasaki, M. Goto and S. Otles (2008). Chemical compositions and antioxidant properties of essential oils from nine species of Turkish plants obtained by supercritical carbon dioxide extraction and steam distillation. Int. J. Food Sci. and Nut., 59 (7-8): 619-634.

Tuck, K.L. and P.J. Hayball (2002). Major phenolic compounds in olive oil: metabolism and health effects. J. Nut. Biochem., 13: 636–644.

Umesha, S.S. and K.A. Naidu (2012). Vegetable oil blends with α-linolenic acid rich Garden cress oil modulate lipid metabolism in experimental rats. Food Chem., 135 : 2845–2851.

Umesha, S.S. and K.A. Naidu (2015). Antioxidants and antioxidant enzymes status of rats fed on ω -3 PUFA rich Garden cress (*Lepidium Sativum* L.) seed oil and its blended oils. J. Food Sci. Technol., 52 (4): 1993–2002.

Wanner, J., S. Bailb, L. Jirovetzb, G. Buchbauerb, E. Schmidtc, V. Gochevd, T. Girovad, T. Atanasovae and A. Stoyanovae (2010). Chemical composition and antimicrobial activity of cumin oil (*Cuminum cyminum, Apiaceae*). Nat. Prod. Comm., 5 (9): 1355– 1358.

Yenge, G.B., H.G. More, S.S. Thorat, R.M. Naik and C.A. Nimbalkar (2017). Storage study of garden cress (*Lepidium sativum* L.) seed oil. J. Pharmacognosy and Phytochem., 6 (3): 09-13.

Youssef, G.M., H.E. El-Ghamery and H.A. El-Sawy (2014). Study the physico-chemical properties and antihyperlipidemic activities of garden cress seed oil. J. Ame. Sci., 10 (12): 324-330.

Zia-Ul-Haq, M.S., L. Ahmad, T. Calani, D.D. Mazzeo, N.R. Pellegrini and V. De Feo (2012). Compositional study and antioxidant potential of *Ipomoea hederacea* Jacq. and *Lepidium sativum* L. seeds. Molecules, 17: 10306-10321.

تقيم الخــواص الطبيعيـــة والكيميائيــة لزيـوت الأذرة والزيتون وحب الرشـاد والكمون ومخاليطها

أحمد سامى محمد عبدالسلام – محمود عبدالرازق دهيم - محمود زكى سطوحى – صلاح الدين محمد لبيب

قسم الكيمياء الحيوية الزراعية – كلية الزراعة – جامعة الزقازيق – مصر

هذه الدراسة أجريت أساسًا لتقييم الخواص الطبيعية الكيميائية لكل من زيت الأذرة – الزيتون – حب الرشاد – الكمون والمخاليط الناتجة عن خلط زيت الأذرة بالزيوت الأخرى على مستوى ١٠%، ٢٠% وتوضح النتائج أن الحمض الدهنى بالمتيك (١٠%) هو الحمض الدهنى المشبع والسائد فى كل زيت (١٠,٤٩ – ١٦,٠٦ – ٨,٩٨ – و٨,٨٤) على التوالى، بينما حمض أوليك (%) كان الحمض وحيد التشبع السائد فى جميع الزيوت(٢٧,٧٦ – ٦٥,٧٢ – ٣٦,٧٥ و٤٣,٣٤ على التوالى)، ومن الأحماض الدهنية عديدة التشبع كان حمض اللينوليك (%) (٥٧,٨١ – ١٢,٤١ – ٤١,٩٩ و٤٠,٤٩)، أوميجا-٣ (%) كان أعلى فى زيت حب الرشاد(٣,٦٣)عن باقى الزيوت الأخرى (٠,٦٥ – ٠,٨٠ و٠,٣٢) على التوالى من المركبات الفينولية، كان المحتوى الأعلى فى جميع الزيوت للمركب الفينولى إليوروبين (٤٠٠,٠ µg/100g – ٦٢٥,٠ µg/100g ٤٩٢٧٢,٠ µg/100g و٢٨٣٨٧,٠ µg/100gعلى التوالى) وكذلك فى المخاليط، والمخاليط بها درجة حموضة، ورقم بيروكسيد، ورقم بارا، انيزيدين أعلى من زيت الذرة، أن الصورة التأكسدية (DPPH) كانت (٢١%-٢٣,١%- ٢٣,٨٠%- ٢٩,٥%- ٢٢,٨% – ٢٧,٨%) أعلى من قدرة الأذرة (١٧,٩%) كما أن قيم K232, K270 للمخاليط كانت أعلى من قيم زيت الأذرة.

المحكمون:

١- أ.د. فاروق جندي معوض أستاذ الكيمياء الحيوية المتفرغ – كلية الزراعة – جامعة عين شمس.

٢- أ.د. سيد سليمان السعدني أستاذ الكيمياء الحيوية المتفرغ – كلية الزراعة – جامعة الزقازيق.